

## Claims

What is claimed is:

1. A composite comprising:
  - a fiber having a lumen with voids;
  - 5 a suspension drawn into the lumen to beneficiate the fiber; and
  - a polymeric material imbedded with the fiber;whereby the natural voids of the lumen are preserved by the suspension causing the fiber to maintain natural density and strength characteristics.
- 10 2. The composite of claim 1 wherein the suspension includes a chemical blowing agent.
3. The composite of claim 2 wherein the chemical blowing agent is exothermic.
4. The composite of claim 3 wherein the chemical blowing agent is azodicarbonamide.
- 15 5. The composite of claim 3 wherein the chemical blowing agent is a hydrazine derivative.
6. The composite of claim 1 wherein the suspension includes a carrier.
- 20 7. The composite of claim 6 wherein the carrier is a film-forming thermoplastic selected from the group of acrylics, epoxies, phenolics, melamines and vinyls.
8. The composite of claim 6 wherein the carrier is a film-forming thermosetting polymer.

9. The composite of claim 1 wherein the suspension includes a catalyst.

10. The composite of claim 9 wherein the catalyst is selected from the group of calcium  
5 carbonate, and compounds of cadmium, zinc, barium, calcium, strontium, magnesium,  
lead, tin or silicon.

11. The composite of claim 1 wherein approximately 1-10 parts of the suspension are mixed  
with approximately 100 parts of the fiber.

12. The composite of claim 1 wherein the fiber is a bast fiber.

13. The composite of claim 12 wherein the fiber is flax.

14. The composite of claim 12 wherein the fiber is hemp.

15. The composite of claim 12 wherein the fiber is jute.

16. The composite of claim 12 wherein the fiber is coir.

17. The composite of claim 12 wherein the fiber is kenaf.

18. The composite of claim 12 wherein the fiber is ramie.

19. The composite of claim 1 wherein the fiber is a wood fiber.
20. The composite of claim 1 wherein the fiber is a wheat fiber.
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21. The composite of claim 1 wherein the fiber is a straw fiber.
22. The composite of claim 1 wherein the fiber is a lingo-cellulosic fiber.
- 10 23. The composite of claim 1 comprising approximately 25% to 99% of the polymeric material.
24. The composite of claim 23 wherein the polymeric material is a polyvinyl chloride foam.
- 15 25. The composite of claim 23 wherein the polymeric material is a polyolefin.
26. The composite of claim 25 wherein the polymeric material is polyethylene.
27. The composite of claim 23 wherein the polymeric material is polypropylene.
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28. The composite of claim 23 wherein the polymeric material is a cellulosic.
29. The composite of claim 23 wherein the polymeric material is a vinyl.

30. The composite of claim 23 wherein the polymeric material is an acrylic.

31. The composite of claim 23 wherein the polymeric material is a urethane.

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32. The composite of claim 23 wherein the polymeric material is a styrenic.

33. The composite of claim 1 further comprising at least one additive that is adsorbed onto a surface of the fiber.

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34. The composite of claim 33 wherein the least one additive that is a coloring agent.

35. The composite of claim 33 wherein the least one additive that is a stabilizer.

15 36. The composite of claim 33 wherein the least one additive that is an antioxidant.

37. The composite of claim 33 wherein the least one additive that is a filler.

38. The composite of claim 33 wherein the least one additive that is an extender.

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39. The composite of claim 33 wherein the least one additive that is a wetting agent.

40. The composite of claim 33 wherein the least one additive that is a bonding agent.

41. The composite of claim 33 wherein the least one additive that is an impact modifier.
42. The composite of claim 1 wherein the composite is formed into a composite structural  
5 member.
43. The composite of claim 42 wherein the composite structural member is a decking board.
44. The composite of claim 42 wherein the composite structural member is an exterior trim  
10 profile.
45. The composite of claim 42 wherein the composite structural member is a railing.
46. The composite of claim 42 wherein the composite structural member is a gazebo  
15 component.
47. The composite of claim 42 wherein the composite structural member is a cladding  
member.
- 20 48. The composite of claim 42 wherein the composite structural member is a molding.
49. The composite of claim 42 wherein the composite structural member is a door jam.

50. The composite of claim 42 wherein the composite structural member is a siding member.
51. The composite of claim 42 wherein the composite structural member is a window profile.
- 5 52. The composite of claim 42 wherein the composite structural member is formed by extruding the composite.
53. The composite of claim 52 wherein the composite structural member is further formed by thermoforming.
- 10 54. The composite of claim 42 wherein the composite structural member is formed by injection molding.
55. A method for making a beneficiated fiber comprising:
- 15       mixing a suspension with a fiber to form a homogeneous mixture;  
      drawing the suspension into a lumen of the fiber by a capillary action to beneficiate the fiber; and  
      cooling the beneficiated fiber.
- 20 56. The method of claim 55 further comprising fluffing the beneficiated fiber.
57. The method of claim 55 wherein the fiber is a bast fiber.

58. The method of claim 55 wherein the suspension includes a carrier, a chemical blowing agent and a catalyst.
59. The method of claim 58 wherein approximately 1-10 parts of the suspension are mixed  
5 with approximately 100 parts of the fiber.
60. The method of claim 55 further comprising adsorbing an additive selected from the group of coloring agents, stabilizers, antioxidants, fillers, extenders, wetting agents, bonding agents and impact modifiers onto a surface of the fiber.  
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61. The method of claim 60 wherein the additives are adsorbed onto the surface of the fiber by mixing at a temperature of approximately 350-500 degrees Fahrenheit.
62. The method of claim 55 wherein the suspension is drawn into the lumen of the fiber by a  
15 continuous kneader/mixer
63. The method of claim 62 wherein the kneader/mixer is at a temperature of approximately 200-350 degrees Fahrenheit.
- 20 64. The method of claim 55 further comprising mixing the beneficiated fiber with a melted polymeric material forming a composite.

65. The method of claim 64 further comprising extruding the beneficated fiber and the polymeric material to form a composite structural member.

66. The method of claim 65 further comprising extruding the beneficated fiber into a sheet.

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67. The method of claim 66 further comprising thermoforming the sheet.

68. The method of claim 64 further comprising the step of injection molding the beneficated fiber and polymeric material to form a composite structural member.

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69. A beneficated fiber comprising:

a fiber having a lumen with voids; and

a suspension drawn into the lumen to beneficate the fiber;

whereby the natural voids of the lumen are preserved by the suspension causing

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the fiber to maintain natural density and strength characteristics.

70. The beneficated fiber of claim 69 wherein the suspension includes a chemical blowing agent, a carrier, and a catalyst.

20 71. The beneficated fiber of claim 70 wherein approximately 1-10 parts of the suspension are mixed with approximately 100 parts of the fiber.



72. The beneficiated fiber of claim 70 wherein the chemical blowing agent is exothermic.

73. The beneficiated fiber of claim 71 wherein the chemical blowing agent is azodicarbonamide.

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74. The beneficiated fiber of claim 71 wherein the chemical blowing agent is a hydrazine derivative.

75. The beneficiated fiber of claim 70 wherein the carrier is a film-forming thermoplastic selected from the group of acrylics, epoxies, phenolics, melamines and vinyls.

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76. The beneficiated fiber of claim 70 wherein the carrier is a film-forming thermosetting polymer.

15 77. The beneficiated fiber of claim 70 wherein the catalyst is selected from the group of calcium carbonate, and compounds of cadmium, zinc, barium, calcium, strontium, magnesium, lead, tin or silicon.

78. The beneficiated fiber of claim 69 wherein the fiber is a bast fiber.

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79. The beneficiated fiber of claim 78 wherein the fiber is flax.

80. The beneficiated fiber of claim 78 wherein the fiber is hemp.

81. The beneficated fiber of claim 78 wherein the fiber is jute.
82. The beneficated fiber of claim 78 wherein the fiber is coir.
- 5 83. The beneficated fiber of claim 78 wherein the fiber is kenaf.
84. The beneficated fiber of claim 78 wherein the fiber is ramie.
- 10 85. The beneficated fiber of claim 69 wherein the fiber is a wood fiber.
86. The beneficated fiber of claim 69 wherein the fiber is a wheat fiber.
87. The beneficated fiber of claim 69 wherein the fiber is a straw fiber.
- 15 88. The beneficated fiber of claim 69 wherein the fiber is a lingo-cellulosic fiber.
89. The beneficated fiber of claim 69 further comprising at least one additive that is adsorbed onto a surface of the fiber.
- 20 90. The beneficated fiber of claim 89 wherein the least one additive that is a coloring agent.

91. The beneficated fiber of claim 89 wherein the least one additive that is a stabilizer.

92. The beneficated fiber of claim 89 wherein the least one additive that is an antioxidant.

5 93. The beneficated fiber of claim 89 wherein the least one additive that is a filler.

94. The beneficated fiber of claim 89 wherein the least one additive that is an extender.

95. The beneficated fiber of claim 89 wherein the least one additive that is a wetting agent.

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96. The beneficated fiber of claim 89 wherein the least one additive that is a bonding agent.

97. The beneficated fiber of claim 89 wherein the least one additive that is an impact  
modifier.

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98. The beneficated fiber of claim 89 wherein the additive is adsorbed onto the surface of  
the fiber by mixing.

99. The beneficated fiber of claim 90 wherein the additive is adsorbed onto the surface of  
the fiber by mixing at a temperature of approximately 350-500 degrees Fahrenheit.

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100. The beneficated fiber of claim 69 wherein the fiber is beneficated at a temperature of  
approximately 200-350 degrees Fahrenheit.